P. dorsalis is one of the few species of the group that is quite distinct from all its neighbours, and presents therefore but little difficulty as to its determination. Its long shaggy fur, peculiar coloration, and proportionately large head and small body distinguish it at once from all its allies. Dr. Jentink's *Hyrax stampflii* presented a remarkable degree of variation in the shape of its lower jaw, and in other characters—variations so great that without a very large series of specimens he naturally considered them to be of specific value. Other specimens, however, since obtained both in Liberia and elsewhere prove the essential identity of *H. stampflii* with *dorsalis*.

February 2, 1892.

W. T. Blanford, Esq., F.R.S., F.Z.S., in the Chair.

The Secretary read the following report on the additions to the Society's Menagerie during the month of January 1892:—

The total number of registered additions to the Society's Menagerie during the month of January 1892 was 56, of which 29 were acquired by presentation, 7 by birth, 6 by purchase, 8 were received in exchange, and 6 on deposit. The total number of departures during the same period, by death and removals, was 71.

Mr. W. Bateson, F.Z.S., exhibited some Crab's limbs bearing supernumerary claws. It was shown that these extra parts are really a complementary (right and left) pair of indices or pollices, according to their position of origin, and not repetitions of the two pincers of the claw, as was commonly stated.

A letter was read from Prof. R. Ramsay Wright, F.Z.S., of the University of Toronto, enclosing and calling attention to some photographs of the heaps of skulls of the American Bison (*Bison americanus*), which are commonly collected on the plains of the Saskatchewan, and are piled up on the sidings of the Canadian Pacific Railway awaiting transport, and which testify to the enormous number of these animals recently exterminated in this district.

Mr. Sclater laid on the table two specimens, in spirit, of chicks of the Partridge Bronze-wing Pigeon (*Geophaps scripta*) which had been hatched in the Society's Gardens on the 7th of June last; also an egg of the same species of bird, laid in the Gardens, and made the following remarks:—

I cannot at all agree with Dr. Bowdler Sharpe in his recent proposal to divide the very natural order "Columbæ" into two portions, and to associate the *Geophabes* or Ground-Pigeons with the Gallinaceous birds [1].

According to the observations we have made from time to time in

[1] See 'Review of Recent Attempts to Classify Birds,' pp. 69, 70.—N.B. The correct plural of *Geophaps* is *Geophabes*, from φάψ, gen. φαβός.

the Society's Gardens, where several species of the Ground-Pigeons [1] have bred repeatedly, the young of the Ground-Pigeons when hatched are nearly naked and quite helpless, and differ in no respect from the young of the typical Columbæ. In proof of this I exhibit two specimens of the young of the Partridge Bronze-wing Pigeon (*Geophaps scripta*), hatched in the Gardens on June 7th last, and about 14 days old when they died. It will be observed that at this date they were barely covered with feathers and hardly fledged. In fact one of them was actually killed by falling from a slight elevation in the Aviary, having been hatched in the nest of a Barbary Turtledove (*Turtur risorius*), to which the egg had been removed in consequence of the bird that laid it refusing to sit upon it. It cannot therefore be said that these birds are "able to run soon after birth." Nor, in the reference given by Dr. Sharpe, does Mr. Gilbert, so far as I can gather from his remarks, say so; he merely states that "the young bird on emerging from the egg is clothed with down like the young of the Quail" (Gould's 'Handbook to the Birds of Australia,' vol. ii. p. 134). I cannot therefore allow that on this ground there is any justification for the important step that Dr. Sharpe proposes to take.

As regards the other point put forward by Dr. Sharpe in justification of his proposal, it is no doubt the fact that the sternum of the Australian Ground-Pigeons is longer and narrower than the corresponding organ in the typical Columbæ. But the general characters of the sternum in *Geophaps* and its allies remain the same as in the typical Columbæ, so that on this point also I see no sufficient ground for the alteration proposed.

I prefer to keep all the Columbæ together, as heretofore, in one group of ordinal value, as constituting a very well-defined and very natural division of the class of Birds, and I even doubt whether more than one family can be properly made of them.

The following papers were read :—

1. On a remarkable Sirenian Jaw from the Oligocene of Italy, and its bearing on the Evolution of the Sirenia. By R. Lydekker, B.A., F.G.S.

[Received December 9, 1891.]

Among a series of Tertiary Vertebrate fossils recently acquired by the British Museum my attention was specially directed to one labelled by the dealer from whom it was received, "Sirene, Oligocaen, Monte Grumi, Vicenza." At the first glance I felt convinced that the assignation of the specimen to the Sirenia was correct; but, at the same time, one of the two teeth contained in the specimen struck me as presenting a peculiarity of form such as I had never seen in any other Sirenian. Further examination led me to the conclusion that the specimen had an important bearing on the

[1] Viz.: *Ocyphaps lophotes*, *Phaps chalcoptera*, *Leucosarcia picata*, *Phlogœnas crinigera*, *Calœnas nicobarica*, and others. See List of Vertebrate Animals (1883), pp. 459 *et seqq.*

unsolved problem of the evolution of the Sirenian order, and that it was accordingly worthy of being brought under the notice of this Society.

Before proceeding to the description of the specimen a few words are necessary as to the Sirenian remains hitherto recorded from the Venetian Tertiaries. Some years ago the late Baron Zigno[1] described and figured a certain number of Sirenian remains from the Miocene of Belluno, in the north of Venice, which were referred to four species, under the names of *Halitherium bellunense*, *H. angustifrons*, *H. curvidens*, and *H. veronense*. At a later period these four species were reduced by Professor Lepsius[2], of Darmstadt, to two; *H. bellunense* being transferred to *Metaxytherium*, while *H. angustifrons* and *H. curvidens* were merged in *H. veronense*. Since to my mind the distinction between *Metaxytherium* and *Halitherium* is not of sufficient importance to be regarded as a generic one, we may, so far as this information goes, reckon the Venetian Sirenians as indicating two species of *Halitherium*, under the names of *H. bellunense* and *H. veronense*.

Vicenza, where the specimen under consideration was obtained, is situated, I need hardly say, in the south-western half of the Province of Venice, a little north of the parallel connecting Verona and the city of Venice. In spite, however, of its distance from Belluno, it is most probable that the mammaliferous beds of both localities are of the same horizon; in which case those of Belluno should be reckoned as Upper Oligocene.

Of the Sirenians from Venetia the types of *Halitherium bellunense* and *H. veronense* exhibit the cheek-teeth in a good state of preservation. In the latter species[3] the upper premolars are very small teeth, with nearly cylindrical crowns. On the other hand, the upper molars are relatively large teeth, with oblong crowns, carrying two transverse ridges, with fore-and-aft talons. The anterior talon in these teeth is very large and prominent, while the posterior one is considerably smaller. Their first transverse ridge is more nearly continuous than the second. When somewhat worn, as is the case with those of the type specimen, these transverse ridges show nearly straight bands of dentine, and not the distinct trefoils observable in the molars of *Halitherium schinzi* from the Oligocene of Hessen-Darmstadt. A distinct tubercle occurs in the inner half of the median transverse valley of these teeth. In Baron Zigno's figures there is no indication of what I shall allude to as a masked selenodont structure in these molars.

Coming now to the consideration of the specimen forming the subject of this communication, of which a representation of the teeth is given herewith (see fig. 1, p. 79), it may be observed, in the first place, that it is a fragment of the left maxilla of a very young mammal of comparatively large size. It shows part of the palatal surface, the

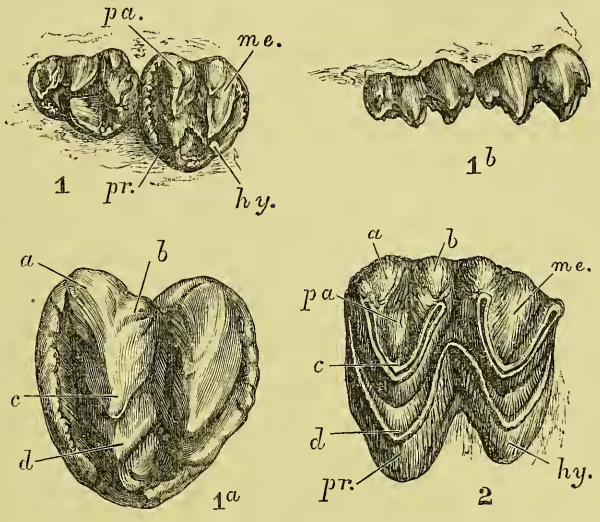
[1] Mem. R. Ist. Veneto, vol. xviii. pp. 438–449, pls. xiv.–xviii. (1875); see also Zigno, *op. cit.* vol. xxi. pp. 291–298, pl. iv. (1880).

[2] Abhandl. mittelrhein. geol. Vereins, vol. i. pp. 1–179, pls. i.–x. (1881–82); see also Capellini, Mem. R. Accad. Ist. Bologna, ser. 4, vol. vii. pp. 39–53 (1886).

[3] Zigno, *op. cit.* vol. xviii. pl. xviii.

external wall, the anterior root of the zygomatic arch, a portion of the floor of the orbit, and the aperture of the canal for the fifth nerve. At the hinder extremity of the palatal surface are preserved two molariform teeth, which are almost or quite untouched by wear, and are, fortunately, uninjured. By filing away the alveolar parapet in front of the anterior one of these teeth, there have been revealed the two roots of a third tooth. Behind the last remaining tooth there is a portion of the alveolus of a fourth tooth which had evidently not been protruded from the gum.

Now the unworn condition of the two remaining teeth and their



Figs. 1, 1 *a*, 1 *b*.—The third and fourth left upper milk-molars of a young individual of *Prorastoma veronense*, viewed from the oral and outer aspects; 1 *a* is $\frac{2}{1}$, the others $\frac{1}{1}$. *pr.*, protocone; *pa.*, paracone; *me.*, metacone; *hy.*, hypocone. The letters *a*, *b*, *c*, *d*, indicate the parts of the hinder tooth which correspond with those similarly lettered in fig. 2.

Fig. 2.—The third left upper molar of *Merycopotamus dissimilis*. Letters as in preceding figure. $\frac{1}{1}$.

position with regard to the anterior root of the zygomatic arch, coupled with the alveolus of the unprotruded fourth tooth, clearly indicate that the jaw belonged to an exceedingly young animal. And, apart from their structure, we should further be justified in regarding the two entire teeth as belonging to the deciduous series if their owner were a diphyodont mammal, or to the premolar series if the animal were monophyodont. There are, however, considerations which enable us to determine the serial homology of the teeth more definitely.

Each of the two teeth carries on its crown well-marked but discontinuous transverse ridges, separated by deep valleys. In the hinder tooth the crown is oblong and nearly symmetrical, and carries

two such ridges; while in front it has a long and prominent talon, and behind a shorter one, which runs upwards to join the inner extremity of the second transverse ridge. In the inner half of the transverse median valley there is a small double tubercle. I shall have more to say on the structure of the ridges of this tooth by-and-by.

The anterior one of the two teeth differs from the other in being much more elongated, and in narrowing gradually from back to front, where it terminates in a blunt point. It has, moreover, three, instead of two, transverse ridges; the second and third ridges corresponding closely in structure with the two ridges of the hinder tooth, while the first ridge is more irregular in shape, and has on its anterior surface a rudiment of the anterior talon of the hinder tooth.

Reverting to the latter, an examination shows that the transverse ridges are not simple continuous ones, but are formed by an inner and outer column, closely pressed together; the whole four columns corresponding to those of an ordinary bunodont molar, like that of a Pig, and representing the proto-, para-, meta-, and hypocone of Professor Osborn's system of notation of these dental elements. A further examination will, moreover, show that these four columns are not of a bunodont type, but are modelled on a peculiar modification of the selenodont structure.

In order to illustrate this I have had figured a left upper molar (fig. 2, p. 79) of the extinct Siwalik genus *Merycopotamus*, which is a specialized representative of the Artiodactyle Ungulate family *Anthracotheriidæ*. It will be apparent from that figure that the external surfaces of the outer columns (paracone and metacone), instead of being nearly upright, are inclined very much towards the centre of the tooth, so that the summits of these columns are squeezed into the crescents formed by the inner columns (protocone and hypocone). It will further be observed that the external surfaces of the paracone and metacone of the *Merycopotamus*-molar carry a median ridge (*c*) flanked by two lateral ridges (*a*, *b*).

Now if the metacone of the hinder tooth in our specimen be compared with that of the *Merycopotamus*-molar, there cannot be any hesitation in recognizing their close similarity in structure—the external surfaces of the outer columns showing the same inclination towards the centre of the crown and having the same general contour. In the present specimen, however, the metacone has assumed a more oblique position to the axis of the crown, and has been squeezed right into the heart of the crescent of the hypocone. In consequence of this the postero-external ridge of the metacone has been lost, and its central and anterior points have come into line with the central cusp of the hypocone to form the imperfect transverse ridge of the molar. A precisely analogous condition obtains with regard to the paracone and protocone[1].

It appears, therefore, to be quite evident that the hinder tooth of the specimen under consideration is constructed on an extreme and

[1] Although these points are apparent enough when the actual specimens are compared, it seems to be impossible to indicate them clearly in a figure.

apparently degenerate modification of the brachydont selenodont molars of certain extinct Artiodactyle Ungulates.

We may, however, go a step further than this. It is, I believe, an attribute of all Artiodactyle Ungulates, whether their cheek-teeth be of the bunodont or of the selenodont type, that while the last upper deciduous or milk-molar resembles the permanent molars in form, the penultimate milk-molar is an elongated tooth of a more complex type than either the last milk-molar or the two succeeding permanent molars. In the adult dentition, on the other hand, the last upper premolar of Artiodactyles is nearly always simpler than the first molar, and in none is it more complex or longer.

Now the two teeth of the specimen under consideration present precisely the same structural relationship to one another as is presented by the penultimate and last (third and fourth) upper milk-molars of Artiodactyles. I take it, therefore, not only that these teeth are third and fourth upper milk-molars, but likewise that they belonged to an animal showing decided indications of Artiodactyle affinities—these affinities being with an Artiodactyle that had assumed selenodont molars more or less closely approaching the *Merycopotamus* type.

This being so, the question arises whether the specimen under consideration may not have belonged to an actual Artiodactyle. To this it may be replied that, so far as I am aware, no Artiodactyle has hitherto been described possessing molar teeth of the type under consideration; so that if the specimen were really Artiodactylate, it would indicate an entirely new form.

Apart, however, from this, the structure of the second tooth in the specimen presents such a marked Sirenian facies that, as I have said, one is prompted to at once refer the specimen to that group of mammals. If, moreover, it be compared with Baron Zigno's figure of the upper molars of *Halitherium veronense*, it will be seen that the last milk-molar of the present specimen accords in almost all respects with these teeth. Both have two interrupted transverse ridges, with a large anterior and a small posterior talon; and in both there is a tubercle a little to the inner side of the middle of the transverse valley. Moreover, both teeth agree in the shape of the crown; while the excess in the size of the teeth of Baron Zigno's specimen over those of the one under consideration is precisely such as we should expect to find between the milk and permanent molars of one and the same animal. It is true, indeed, that in Zigno's figure what I may call the masked selenodontism of the teeth under consideration is not apparent. This may, however, be due to the circumstance that the teeth of the type of *H. veronense* are considerably worn; while it may also be in part owing to the difficulty of expressing such features in a lithograph. Moreover, there is the possibility that the masked selenodontism of the milk-molars may not have been retained in the permanent dentition.

In regard to the existence of a deciduous dentition in the Sirenia, it is already known that milk-molars and premolars were developed in *Halitherium schinzi*. It is, however, probable that in that species

the milk-molars were not like those of the present specimen, since the permanent molars were of a more Hippopotamus-like structure than are those of *H. veronense*, and show no indications whatever of selenodontism.

Conclusive evidence of the Sirenian nature of our fossil is, however, afforded by the orbital region, which is almost exactly the same as in the Sirenian from Jamaica described by Sir R. Owen[1] as *Prorastomus sirenoides*. In both we have the same peculiar eversion and projection of the lower border of the orbit which is absolutely characteristic of the Sirenia. In both, again, we notice the extraordinary size of the foramen for the exit of the fifth nerve, and its immediate proximity to the anterior border of the orbit, these being also distinctive Sirenian features.

Then, again, a comparison of the last milk-molar with the upper molars of *Halitherium schinzi* (*e. g.* B.M. No. 40859) clearly shows the ordinal identity of the two forms.

I take it, therefore, that the Sirenian nature of the Vicenza specimen is certain; and since its milk-molars agree in general structure and relative size with the permanent molars of *Halitherium veronense*, which occurs in the same country and probably on the same geological horizon, the evidence appears to be very strongly in favour of the reference of the specimen in question to that animal.

Apart, however, from any question of specific reference, the specimen before us undoubtedly throws a flood of light on the origin of the Sirenia, and points clearly to their derivation from an ancestor belonging to an Artiodactyle Ungulate with short-crowned and selenodont molar teeth. It is, indeed, no new idea that the Sirenians show Ungulate affinities, this presumed origin having been very strongly urged by many zoologists; although Professor Flower, writing in the article "Manatee" in the 'Encylopædia Britannica,' expresses his opinion that the few facts at present known relating to the ancestry of the Sirenians "lend no countenance to their association with the Cetacea, and on the other hand their supposed affinity with the Ungulata, so much favoured by modern zoologists, receives no very material support from them." If, however, my interpretation of the affinities of the present specimen be accepted, it will go a very long way towards solving the problem of the Sirenian genealogy.

So far as I am aware, the component elements of the molar teeth of the Sirenians have not hitherto been homologized with those of mere typical teeth. The molars of the present specimen clearly show us, however, the homology of the elements of the simple and continuous transverse ridges found in *Manatus* and *Halitherium schinzi*, such ridges being clearly only one step more in the degeneration from a selenodont type exhibited in the molars of the specimen before us.

I may add that although the upper permanent molars of *H. veronense* differ considerably from those of more typical species of *Halitherium*, while there is no evidence that the latter had milk-molars of the type of the present specimen, yet I should not on

[1] Quart. Journ. Geol. Soc. vol. xxxi. p. 559, pls. xxxviii., xxxix. (1875).

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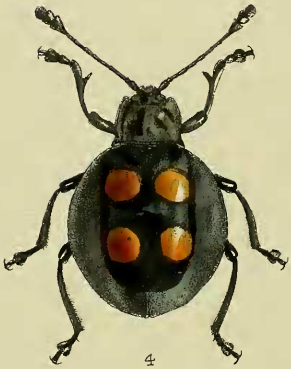

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West, Newman ad nat. lith.

Coleoptera from Kina-Balu

these grounds be disposed to regard the former as the representative of a distinct genus.

I find, however, by a comparison of Baron Zigno's figures with skulls of *Halitherium schinzi* and *Prorastomus sirenoides*, that the skull of *Halitherium veronense* differs altogether from the former and agrees with the latter. This is shown in its long and narrow contour, narrow and elliptical narial aperture, slight deflection of the rostrum, and the form of the inferior border of the orbit; all of which are in marked contrast to those of *Halitherium schinzi*. Further, although the molars of *Prorastomus sirenoides* are much worn and are only imperfectly shown, yet one of them clearly exhibits the large anterior talon characteristic of the so-called *Halitherium veronense*, such talon being represented in *H. schinzi* by a much smaller one. The extremities of the jaws of the Venetian species being unknown, I can of course say nothing as to the incisors, which are present in *P. sirenoides*. From the other evidence *H. veronense* may, however, be pretty confidently transferred to the genus *Prorastomus*, or, as it should be, *Prorastoma*, under the name of *P. veronense*.

2. Descriptions of Coleoptera collected by Mr. John Whitehead on Kina Balu, Borneo.—Families *Hispidæ, Erotylidæ, Endomychidæ, Lycidæ, Lampyridæ*, &c. By the Rev. H. S. Gorham, F.Z.S.

[Received December 23, 1891.]

(Plate IV.)

The Coleoptera of which it is the purpose of this paper to give an account were collected by Mr. J. Whitehead during his residence from 1886 to the middle of 1887 in the neighbourhood of Kina Balu, and for the most part in the early months of those years.

This mountain is a plutonic mass rising abruptly on one side to an altitude of about 13,000 feet, clothed at its base and to about 4000 feet with forest and low trees. Owing to its summit being bare, a denuded granitic surface, few insects were obtained by Mr. Whitehead above that height.

The best collecting grounds were found to be the river-beds, and at the altitudes mentioned the usual tropical conditions obtain. Representing as Kina Balu does the primitive upheaved portions of this part of the world, which have been in all probability above the sea during geologic ages, it was to be expected that both its fauna and flora would prove of the most interesting type, and judging from the few species of insects now under review this certainly appears to be the case.

Several species were unfortunately only represented by single specimens, and some of these I am unable at present to determine. The collection is now in Mr. Alexander Fry's possession, who has kindly placed a portion of it at my disposal for description.

Hispidæ.

Prionispa, Chapuis.

Prionispa pulchra, n. sp. (Plate IV. fig. 2.)

Rufa, supra metallico-viridis, prothorace elytrisque subopacis, rufo-marginatis, grosse punctatis, his tuberculis tribus conicis; humeris costatis, et angulo posteriore spiniformi. Long. 6 *millim.*

Hab. Borneo, Kina Balu (*Whitehead*).

Body beneath and legs red; head red except the crown; antennæ blackish, their basal joint sometimes wholly red; the front produced and with a carina between the bases of the antennæ; thorax subquadrate, coarsely punctured at the sides, obsoletely so in the middle, green above and opaque, red beneath. Elytra with the shoulders elevated, with a double costate elevation in addition to the costate submarginal interstice, and three conical elevations, of which the middle is the larger and which on its exterior side is excavated, and metallic and not green in that part; the spine-like production of the hind angle is large and sharp and compressed horizontally, it is green in the middle but fiery copper at its apex; the sutural angle is yellow, and the margins of the elytra external to the humeral callus are brownish with a coppery or purple reflexion. The apical margin is not toothed, but there are one or two minute serrations at the base of the spine.

Six specimens of this beetle were obtained by Mr. Whitehead at about 1000 feet altitude on Kina Balu.

Hispopria, Baly.

Hispopria grandis.

Hispopria grandis, Baly, Cat. of Hisp. in Coll. Brit. Mus. 1858, p. 95.

Kina Balu (*Whitehead*), 2 specimens.

Anisodera (Chevr.), Baly.

Anisodera, sp. n. (*a*).

Kina Balu. A dull red species apparently belonging to Sect. A. *b* of Baly's Catalogue. The species of *Anisodera* are so difficult to distinguish, that I do not feel disposed to describe this till I have further acquaintance with them.

Anisodera, sp. n. (*b*).

Kina Balu (*Whitehead*).

A single specimen of a smaller species with black legs and antennæ, and much rougher elytra and coarsely punctured thorax.

Erotylidæ.

Tetralanguria splendens, Wied.

Kina Balu, many examples.

TRIPLATOMA ATTENUATA.

Triplatoma attenuata, Crotch, Cist. Ent. 1876, p. 405.

Nesites attenuata, Bedel, Rev. Triplatoma, Ann. Mus. Civ. Gen. 1882, p. 10, t. x. f. 5.

Kina Balu. Has occurred also at Sarawak and in Sumatra. Bedel's figure does not give a correct idea of the narrowness of the thorax in proportion to the width of the elytra.

TRIPLATOMA GESTRÖI.

Triplatoma geströi, Bedel, *l. c.* p. 440, t. x. f. 4; Gorham, P. Z. S. 1883, p. 80, t. 18. f. 1.

Labuan, Sarawak.

Also occurs in Sumatra.

ENCAUSTES MARGINALIS.

Encaustes marginalis, Crotch, Cist. Ent. 1876, p. 477.

Kina Balu.

ASMONAX, genus novum.

Characteres plerumque sicut in Encauste; *differt antennarum articulo tertio vix longiore quam secundus, prothoracis lateribus compressis, sinuatis, angulis anticis depressis, disco inæquali, bicostato, elytris interstitiis alternis costato-elevatis.*

This new genus is nearly allied to *Encaustes*, but has a very different facies owing to the form of the thorax, and the costæ on it and on the elytra. The front of the prosternum is plain as in *Encaustes*, that is to say, not elevated nor brought into a point in front as in *Micrencaustes*.

ASMONAX WHITEHEADI, n. sp. (Plate IV. fig. 5.)

Anthracinus, niger, nitidus; antennis articulis octo globuliformibus, tertio vix elongato, tribus ultimis transverso-compressis, pubescentibus; capite opaculo, fere lævi, inter antennas transverse impresso; prothorace transverso-subquadrato, ad angulos posticos parum angustato, lævi, in medio nitidulo, obsolete haud acute bicostulato, ad margines subopaco, antice posticeque obsolete fossulato, punctis nonnullis hic illic dispersis, margine laterali tenuiter elevato; elytris tenuiter punctato-striatis, costis tribus elevatis, quarta etiam externa cum suturali ad apicem conjuncta, seriebus duobus inter costas singulas. Abdomen fortiter sparse punctatum. Long. 18–19 *millim.*

Hab. Borneo, Kina Balu and North Borneo (*Whitehead*).

Wholly black and shining, subopaque in places, as the sides and lateral reflexed underside of the thorax. Owing to the form of the thorax, which has the sides sinuate, turned in and downward at the front angles, and the strong double ridge on the centre of the thorax, this species has a remarkable and Endomychid appearance; the costate elytra are an exaggeration of what takes place in such species as

E. opaca, Crotch. The shortening of the third joint of the antennæ and their bead-shaped appearance show this to be a strongly modified form. The femora are compressed and sinuous just as in *Encaustes*; the middle tibiæ have a tooth-like projection externally, just above the insertion of the tarsi, and are pubescent internally at their apices. The elytral epipleura are pitchy brown, but not noticeably so, and have obsolete transverse wrinkles.

I have only seen four examples of this species, viz. those obtained by Mr. Whitehead. I cannot distinguish the sexes.

Endomychidæ.

Amphisternus armatus, n. sp. (Plate IV. fig. 3.)

Niger, opacus, obsolete varioloso-punctatus; thorace subquadrato, angulis anticis acutis, valde productis; elytris spinis duabus acutis æneo-micantibus, una subhumerali, altera conoidea in medio, apice acute mucronato, tuberculisque duobus nigris nitidis, uno basali uno apicali; femoribus clavatis, apicibus piceis. Long. 8 *millim.*

Hab. Borneo, Kina Balu (*Whitehead*).

Rather larger than *A. spinicollis*; and at once distinguished from both the described species of *spinous Amphisterni* by the two *black* tubercles, the produced front angles of the thorax, which are like those of *A. auriculatus* but not reflexed, and by the fiery coppery or æneous colour which is seen on the shining parts. The head is thickly punctured, rather shining, and the antennæ have all the joints from the third to the eighth elongate, the third longer than the two following united; the sides of the thorax are slightly angulate in the middle and narrow a little to the base; the disk is quite opaque, with coarse confluent large punctures. Of the elytra the anterior tubercle has a pitchy tint, the humeral angle is reflexed and smooth, as is the basal margin; the first lateral spine is a little below the shoulder, very long and acute, wide at its base, but compressed if viewed from behind, brassy black; the middle spine more upright but still divaricating, conoidal at its base; both spines punctured at their base, as the elytra are. The posterior tubercle is bluish black and smooth; the apical production of the elytra is external to and independent of the sutural angle, which is itself quite distinct—it is in fact part of the margin itself, the epipleural fold being continued along it as a groove. The legs are brassy black, the club of the femora distinctly pitchy.

Several specimens of this interesting new species were obtained by Mr. Whitehead.

Eumorphus tumescens, n. sp. (Plate IV. fig. 4.)

E. marginati *statura et similitudine; niger, elytris nigro-cæruleis, late (humeris minus) marginatis, apicibus subacutis, maculis quatuor magnis aurantiacis. Long.* 17, *lat.* 13 *millim.* ♂.

Mas, elytris in medio conjunctim alte et acute elevatis, prothoracis angulis posticis acutis, haud longe productis; tibiis

anticis infra medium dente acuto valde distante armatis; haud compresso-sinuatis.

Hab. Borneo, Kina Balu (*Whitehead*).

Antennæ longer than in *E. marginatus*, all the joints from the third, and the club, being longer. The thorax is not so broad, especially at the base, the hind angles in the male not being nearly so much produced, but still they are acute; its disk is more uneven, there being in the single male before me an impressed pit on each side of the centre; the elytra have the expanded margin more gradually widened, so that it is narrower at the shoulders than in *E. marginatus*. The four spots are larger in proportion, and placed nearer together than in that species, and they are more acuminate at the apex, and the middle of their disk is much more acutely raised, the summit of this raised part being conical and nearer the two anterior spots than the corresponding part in *E. marginatus*. The front tibiæ in the male are nearly straight, not strongly sinuous nor distorted as in *E. marginatus*, but a little compressed laterally with a short external groove at their apices (for the reception of the tarsi), but not grooved along their whole length.

This insect has also some analogy with *E. turritus*; but the larger yellow spots and the dark blue colour of the elytra, as well as the structure of the tibiæ, will at once distinguish it.

One specimen, a male, obtained by Mr. Whitehead.

EUMORPHUS COSTATUS.

Eumorphus costatus, Gorham, Endom. Rec. p. 34.

Mas, tibiis anticis dente acuto valde distante in medio armatis; tibiis intermediis et posticis mediocriter curvatis, his intus ciliatis.

I believe a single male and female from Kina Balu to be identical with the species described by myself from two female specimens from Celebes. The male has the elytra shining, and with an indistinct violet tint, while the female is subopaque and is distinguished by a short keel on the elytra at their base near the scutellum. The yellow spots are large, and cause the species to recall *E. quadrinotatus*. The male has the hind angles of the thorax acutely produced, by which it is at once separated from *E. quadrinotatus*.

EUMORPHUS GUERINI.

Eumorphus guerini, Gorham, Endom. Rec. p. 33.

Many specimens of this were obtained by Mr. Whitehead; all I have yet seen are males. Hitherto only seen from the Malay peninsula.

EUMORPHUS LUCIDUS, n. sp. (Plate IV. fig. 1.)

Nigro-subviolaceus, nitidus; elytris ovatis, apice acuminatis, maculis duobus rotundatis aurantiacis nitidis, anteriore parum tumida; thorace (feminæ) subopaco. Long. 9 *millim.* ♀.

Hab. Borneo, Kina Balu (*Whitehead*).

It is difficult to compare this species with any other of the genus;

the elytra are very slightly margined, but are acuminate at their apex, and not very strongly convex. It is entirely black, with the exception that the elytra have a faintly violet tinge and are very smooth and shining, the four spots are moderate in size, and round, very smooth, but not raised; the thorax (of the female) is opaque, with two rather obsolete basal impressions and a central channel, its sides are a little angular in the middle, contracted to the front angles. The antennæ are of moderate length, the fourth to the eighth joints a little longer than wide, the three club-joints subequal, transverse, not much compressed.

Four specimens were found by Mr. Whitehead. This species may be placed after *E. guerini*, Gorh.

Lycidæ.

Metriorrhynchus, sp. inc.

Hab. Borneo, Kina Balu (*Whitehead*).

A single example (♀) of a *Metriorrhynchus* allied to *M. geometricus*, but larger, and precisely similar in colour to *Xylobanus reticulatus*, Gorh., of which there is an example from the same region. It is also very close to *M. infuscatus*, Gorh., Notes from Leyd. Mus. iv. 1882, p. 96.

Metriorrhynchus, sp. inc.

Kina Balu (*Whitehead*).

A single specimen of a species allied to *M. sericeus*, but with much brighter red elytra, apical half black.

Metriorrhynchus, sp. inc.

Kina Balu (*Whitehead*).

Unfortunately also a single specimen only of a species with the double rows of cells distinct and wide, black with red elytra, of which the apical quarter is black, and black marks at their base. Allied to *M. cinnabarinus*, Gorh.

Xylobanus reticulatus. (Plate IV. fig. 6.)

Xylobanus reticulatus, Gorh., Notes from Leyd. Mus. 1882, p. 96.

Hab. Borneo, Kina Balu (*Whitehead*).

A single specimen, apparently of this species.

Telephorus viridanus.

Telephorus viridanus, Gorh., Notes from Leyd. Mus. vol. iv. 1882, p. 105.

Hab. Borneo, Kina Balu (*Whitehead*).

A single specimen.

Lyropæus, n. sp.

Kina Balu (*Whitehead*).

A single specimen of a new species of this remarkable genus.

Lampyridæ.

Vesta aurantiaca. (Plate IV. fig. 9.)

Vesta aurantiaca, Ern. Oliv., Notes from Leyd. Mus. vol. viii. 1886, p. 192.

Hab. Borneo, Kina Balu (*Whitehead*).

M. Ernest Olivier has separated under this name specimens of a *Vesta* referred by me to *Vesta urens*, described by myself from Borneo (*cf.* Notes from Leyd. Mus. vol. v. 1883, p. 3). Three specimens collected by Mr. Whitehead on Kina Balu agree precisely with one of these specimens from Sumatra in my possession. As the specimen which M. E. Olivier redescribes as the type of my *V. urens* is now at Leyden, I have no means of forming an opinion on the specific distinction of *V. aurantiaca*, but it certainly occurs in Borneo, as these specimens prove.

Pyrocœlia, Gorham.

Pyrocœlia collaris, n. sp. (Plate IV. fig. 7.)

Oblonga, subparallela, opace nigro-fumosa; prothorace brevi, transverso, flavo, distincte at tenuiter carinato, margine antico late et alte reflexo, basi recte truncato, angulis posticis subrectis, nullo modo productis; pygidio flavo. Long. 20 *millim.*

Hab. Borneo, Kina Balu (*Whitehead*).

Head black, eyes moderate; antennæ long and thin for this genus, nearly as in *P. fumigata*, the joints much longer than wide and not serrate; thorax almost semicircular, with the margins much reflexed, the diaphanous lunules not very translucent. Elytra entirely smoky black, two costules moderately distinct for about two thirds of the length of the elytra, the intermediate one very obsolete; scutellum, head, legs, and body entirely dull black, with the exception of the apical ventral segment and pygidium and of the two luminous patches.

This insect is apparently allied to *P. opaca*, Bourg., described and figured in the 'Annali del Museo Civico di Storia Naturale di Genova,' vol. ii. 1885, p. 349, t. v. f. 2, from which, however, it differs by the scutellum being black, by the entirely black legs and body, and by the absence of the pubescence, and (judging by the figure) by the thinner and not serrate antennæ.

One specimen.

Diaphanes, Motschulsky.

Diaphanes apicalis, n. sp. (Plate IV. fig. 8.)

Breviter oblongus, subopacus, ochraceus; prothorace brevi, margine antico elevato, lunulis duabus translucidis; disco antice tenuissime carinato; elytrorum apicibus, antennis, palpis, pedibus, abdomineque (apice excepto) nigris. Long. 14 *millim.*

Hab. Borneo, Kina Balu (*Whitehead*).

This species resembles rather closely *Pyrocœlia terminata*, Gorh., but from the thin antennæ and the size of the eyes and the clear

translucent spaces of the thorax it ought rather to be placed in the genus *Diaphanes*. The thorax is shorter and has the hind angles less produced than is usual in this genus; the apical ventral plate and the pygidium are yellow; the head, breast, and the extreme base of the legs are yellow, but clouded in parts with fuscous.

One specimen.

EXPLANATION OF PLATE IV.

Fig. 1. *Eumorphus lucidus*, ♀, p. 87.
2. *Prionispa pulchella*, p. 84.
3. *Amphisternus armatus*, p. 86.
4. *Eumorphus tumescens*, ♂, p. 86.
5. *Asmonax whiteheadi*, p. 85.
6. *Xylobanus reticulatus*, p. 88.
7. *Pyrocœlia collaris*, p. 89.
8. *Diaphanes apicalis*, p. 89.
9. *Vesta aurantiaca*, p. 89.

3. On the Coleoptera collected by Mr. W. Bonny in the Aruwimi Valley, Central Africa. By the Rev. H. S. Gorham, F.Z.S., and C. T. Gahan, M.A.

[Received December 23, 1891.]

In the following paper the Coleoptera of the families Cleridæ, Bostrychidæ, Chrysomelidæ, Galerucidæ, Cassidæ, Hispidæ, Erotylidæ, and Coccinellidæ collected by Mr. W. Bonny during the Emin Relief Expedition are noticed and the presumed new species are described, in continuation of the accounts already furnished by Mr. Bates (P. Z. S. 1890, pp. 479–492, and Mr. Champion, pp. 637–646). The species of which examples were represented were not numerous, but the same remarkable coincidence specifically with the Coleoptera of the West Coast, especially of Old Calabar, will be noticed.

The Phytophaga, with the exception of the Cassidæ and Hispidæ, have been kindly worked out by Mr. Gahan of the British Museum.

Family Cleridæ.

1. Cylidrus fasciatus, Laporte.

Cylidrus fasciatus, Laporte, Cast. Silb. Rev. iv. p. 35.

Var. B. spinolæ.

While the type of this species is from Senegal, the var. B is recorded from Madagascar. It is also in my collection from Natal.

Family Bostrychidæ.

2. Apate terebrans, Pallas.

Apate terebans, Pallas, Spicil. Zool., Ins. p. 7.

3. Apate sp. inc.

Probably *A. productus*, Imhoff.

Family Chrysomelidæ. (By C. J. Gahan, M.A.)

Megalopodinæ.

4. Pœcilomorpha murrayi, Baly.

This species was founded upon specimens from Old Calabar.

Eumolpinæ.

5. Corynodes bonnyi, n. sp.

C. cyaneo *simillimus, sed differt elytris crebre punctatis vix nitidis, et articulis antennarum quinque ultimis plus dilatatis. Long.* 10½ *millim.*

Resembling very much in colour and general appearance *C. cyaneus*, Fabr. The last five joints of the antennæ are strongly dilated, the seventh joint triangular, the eighth to eleventh subquadrate, transverse, the ninth and tenth each almost as broad as long. Prothorax shining, sparingly and not very distinctly punctured. Elytra rather dull, thickly punctured. Claws of tarsi cleft, with the inner division acute, shorter than the outer.

The species may be distinguished from *C. compressicornis* (which it resembles in the punctuation of the elytra) by the greater dilatation of the apical joints of its antennæ and by the sparser punctuation of its pronotum.

6. Colasposoma aruwimiense, n. sp.

Cyaneum, nitidum; pedibus viridescentibus; prothorace quam latior vix duplo longiore, dense punctulato; elytris crebre et sat fortiter punctatis, lateribus utrisque obtuse vel obsolete unicostatis. Long. 8–10 *millim.*

Dark blue, with the legs metallic green; head, prothorax, and scutellum varying to metallic green. Head rather thickly and not very strongly punctured. Prothorax with its median length rather more than half the width measured across the base; thickly and not strongly punctured above; lateral margins rather feebly convex. Scutellum sparsely punctured. Elytra very thickly and rather strongly punctured, with the punctures running together to form a feeble rugosity on the sides just below and behind the shoulders. Beginning a little behind the shoulder there is a single obtuse and slightly elevated costa, along the side of each elytron; this costa is sometimes obsolete. The shoulders of the elytra are slightly prominent.

The present species may perhaps be only a local variety of a species (*C. fairmairei*, Lefèv.) occurring in Old Calabar. The latter has the prothorax much more distinctly punctured, the punctures being larger and less closely placed together. The colour is very variable—dark blue, metallic green, and bronze-purple.

7. Colasposoma, sp.

A single specimen, differing from the preceding in its colour—a

bright metallic green—and in having a slight depression on the outer disk of each elytron a little below the base. There is no trace of a costa on the sides of the elytra. Possibly only a variety of the preceding.

Chrysomelinæ.

8. Chrysomela opulenta, Reiche.

Chrysomela opulenta, Reiche, Voy. Galin. Abyss. p. 405, t. 25. fig. 7.

Galerucinæ.

9. Oïdes typographica, Ritsema.

Oïdes typographica, Ritsema, Tijdschr. Ent. xviii. p. 21.

One example.

10. Cerochroa maculicollis, Baly.

Cerochroa maculicollis, Baly.

11. Hyperacantha hypomelæna, Thoms., var.

In this variety, which occurs also at Old Calabar, the abdomen is entirely fulvous. In other respects it agrees with the typical form.

(Specimens of this insect stand in Murray's collection as *Diacantha beninensis*, H. S. G.)

12. Hyperacantha flavonigra, Thoms., var.

Elytra black, with a submedian transverse yellowish band, which does not reach the outer margins, and each with a small testaceous spot at the extreme apex. This variety is represented by a single female specimen, which I refer to *H. flavonigra*, Thoms., on account of the similarity in the contour of the last abdominal segments. The ventral segment is rather deeply incised on each side at the apex, while the median lobe thus cut off bears a shorter incision or notch placed a little *to the right of the middle line*. The dorsal segment is emarginate in the middle at the apex.

13. Bonesia serricornis, Thoms., var.

Elytra black; each with two testaceous patches—one behind the shoulder and extending inwards on to the disk, the other just behind the middle. In the typical forms of *B. serricornis* the elytra are black with a varying proportion at the apex testaceous.

Mr. Jacoby has referred *B. serricornis*, Thoms. (*Ootheca*), to the genus *Æthonea*, Baly; but I can find no sufficient difference by which to distinguish the latter from *Bonesia*, Baly. The one genus was founded upon a male, the other upon a female specimen, each belonging to a different species. The anterior cotyloid cavities are usually only very slightly open behind, and may in certain cases (some specimens of *B. murrayi*, Baly) be completely closed in.

14. Pachytoma obscura, n. sp.

Obscure ferrugineo-testacea; scutello, corpore subtus, pedibus antennisque (his basi testaceis exceptis) nigris; prothoracis lateribus a basi usque ad tertiam partem anticam divergentibus, deinde convergentibus; elytris crebre punctulatis.

Resembles *P. gigantea*, Illig., but differs from this and the other species known to me by the shape of the pronotum, which, narrowest at the base, gradually widens up to about the anterior third or fourth, thence narrowing again to the apex. The last ventral segment of the abdomen in the female has a rather deep longitudinal pit or groove along the middle of the apical half of the segment.

15. Ornithognathus generosus, Thoms.

Family Hispidæ. (By H. S. Gorham, F.Z.S.)

16. Cryptonychus murrayi, Baly.

Cryptonychus murrayi, Baly, Cat. Hisp. p. 76, t. 6. f. 5.

One example and one var.

The variety has the thorax narrower, more thickly punctured all over the surface, with confluent elongate sculpture; the elytra have a large dorsal black patch, widest in the middle and extending to the sides, and the apex more narrowly black than in the type; and the whole upper surface is more opaque. It possibly represents a different species.

All the species of *Cryptonychus* hitherto described have been from the West Coast of Africa; the specimens of the late Mr. Murray are now in my collection.

Family Cassidæ. (By H. S. Gorham, F.Z.S.)

17. Aspidomorpha spectabilis, Bohem.

Aspidomorpha spectabilis, Bohem. Mon. ii. p. 245.

A single specimen.

18. Aspidomorpha tigrina, Oliv.

Aspidomorpha tigrina, Oliv. Ent. vi. no. 97, p. 957, t. 5. f. 8.

19. Aspidomorpha westermanni, Bohem.

Aspidomorpha westermanni, Bohem. Mon. ii. 262.

This is the female of *A. quadrimaculata*, Oliv., sec. Gemm. and Harold, Cat.

A single specimen.

20. Aspidomorpha stolata, Bohem.

Aspidomorpha stolata, Bohem. Mon. ii. p. 274.

Several specimens referable to this or a closely allied species.

21. Aspidomorpha togata, Thoms.

Aspidomorpha togata, Thoms. Arch. Ent. ii. 1858, p. 227.

One example.

22. Aspidomorpha, sp. ?

A single example. The disk of the elytra is wholly black.

23. Aspidomorpha aruwimiensis, n. sp.

Ovata, nigra; prothorace elytrisque pallide testaceis, his irregulariter (dorso subseriatim) punctatis; illo basi quam elytra angustiore, maculis duabus rotundis nigris, margine antico subreflexo. Long. 12, *lat.* 9 *millim.*

The body, head, legs, and antennæ of this species are wholly black, the latter about as long as to reach to the hind angles of the thorax, their third joint half as long again as the fourth. The thorax has the extreme edge of the margin blackish; there are a few obsolete punctures on each black spot and on the lobe just before the scutellum. The scutellum is black, but has a yellow mark at its apex, it is indistinctly impressed. The humerus is prominent; the elytra are destitute of marks above or beneath, the extreme edge is very faintly brownish; the punctuation is distinct but irregular, here and there, as near the suture and in one row starting from the callus, forming series.

Two specimens of this insect were obtained by Mr. Bonny in the Aruwimi Valley. It has not very much the appearance of an *Aspidomorpha*; the claws are, however, pectinate at their base; and in general structure it seems to me to agree better with that genus than with any other known to me.

24. Laccoptera intricata, Klug.

Laccoptera intricata, Klug, Bohem. Monogr. iii. p. 59.

One example. This species is extremely common at Old Calabar and at other places in Guinea.

25. Cassida signatipennis, Bohem.

Cassida signatipennis, Bohem. Monogr. ii. p. 345.

One specimen. This species is also common at Sierra Leone and in Senegal.

26. Cassida bonnyana, n. sp.

Cassidæ hepaticæ *statura et summa similitudine; nigra, prothorace elytrisque brunneis, his vix nitidis, creberrime minute punctatis, illo punctis duobus discoidalibus nigris, margine antico elevato. Long.* 13, *lat.* 9 *millim.*

The inner side of the first four joints of the antennæ, the epistoma, and a dot on the crown of the head are rufous; the thorax and elytra reddish brown, on each side of the middle of the disk of the former is a black dot of medium size, and this together with the rather dull surface will at once distinguish this species from *C. hepatica*

or any other of its near allies. The prosternum is black and has the process deeply impressed (as in the allied species); the metasternum is black and shining; and the abdomen is black, with the fifth and apical segments rufous, and the three segments preceding these with a yellow spot at the side of each.

One specimen obtained by Mr. Bonny.

27. Cassida strigosa, n. sp.

Elliptico-ovata, nitida; elytris marginibus subexplanatis, subviridibus, irregulariter punctatis, disco concinne punctato-striatis; corpore nigro; capite, antennis (articulis duobus ultimis prætermissis), femorum apicibus, tibiis, tarsis, margineque toto flavis. Long. 9, *lat.* 7 *millim.*

Not very nearly allied to any species known to me. The outline is very evenly elliptical, with the whole (both thoracic and elytral) margin rather widely but evenly flattened. The green colour has apparently extended over the whole but faded to brown; the suture is narrowly reddish, and is hardly more distinctly marked beneath than above. The striæ are rather deep, with closely packed punctures and convex interstices; a row of larger punctures entirely surrounds the disk, separating it from the expanded margin.

Two examples.

28. Cassida fuscopunctata, n. sp.

Breviter ovata, lutea, nitida; antennarum articulo ultimo toto, penultimo partim nigro; elytris nitidis, disco seriatim fusco-punctatis, marginibus subreticulatis, prothoracis angulis externis rotundatis. Long. 6–7, *lat.* 5–6 *millim.*

Hab. Arnwimi valley (*Bonny*), W. Africa (*coll. Gorham*), Old Calabar (*coll. Murray*).

I propose this name for a very plain-looking *Cassida*, which I obtained from the collection of the late Mr. A. Murray, standing as "*C. pallidula*, Bohem.," but the species so named by that author is referred to Mexico. The same insect as Murray's is in my collection from other sources named "*C. pallidula*." It therefore appears that Boheman had suggested this name for the African insect when he examined Mr. Murray's collection, but that he subsequently described another species under that name.

C. fuscopunctata is very shining and even, nearly as broad as long; in life it would seem to be greenish, from the tint on the disk and on the thorax in the fresher examples. The reticulation of the thorax and of the sides in the elytra is very distinct, and there is a submarginal row of larger cell-like punctures at the edge of the disk. The disk of both elytra and thorax is evenly and moderately convex; the underside and antennæ except the apex are wholly luteous.

One example from Central Africa (*Bonny*); many in Murray's collection from Old Calabar, now in my own collection.

Family Erotylidæ.

29. Linodesmus cæcus.

Elater cæcus, Fabr. Gen. Ins. Mant. p. 234 (1777).
Episcapha cæca, Lacord. Mon. Erotyl. p. 62.
Triplatoma cæca, Crotch, Rev. Erotyl. p. 406.

The specimens of this species, about twelve in number, from Central Africa present a slight difference from those of Old Calabar in that the posterior fascia returns towards the apex along the suture for a little way. It is the species which Mr. Champion remarks as mimicking or mimicked by *Tarasides pictus*. The resemblance is, however, rather general than very close.

30. Megalodacne furcata, Gorham.

Megalodacne furcata, Gorham, Proc. Zool. Soc. 1883, p. 79.

Described from W. Africa.

31. Episcaphula obliquata, Lacord.

Episcaphula obliquata, Lacord. Mon. Erotyl. p. 60.

Var., three specimens.

The basal fascia has not the outer denticulation in the middle so much produced, nor is it obliquely recurved towards the suture as in Old Calabar specimens, and two of the specimens (which are males) have the elytra more acuminate than is the case in any of the West Coast specimens I have seen.

32. Episcaphula interrupta, Lacord.

Episcaphula interrupta, Lacord. Mon. Erotyl. p. 57.

One example.

33. Palæolybas dorsalis, Gorham.

Palæolybas dorsalis, Gorham, Notes from Leyd. Mus. x. p. 144 (1888).

Described from Liberia and Niam-Niam .

Family Coccinellidæ.

34. Chilomenes lunata, Fabr.

One example.

35. Epilachna reticulata, Muls.

Epilachna reticulata, Muls. Spec. Trim. p. 794.

36. Epilachna 14-signata, Muls.

Epilachna 14-signata, Muls. Spec. Trim. p. 741.

One example.

37. Epilachna hirta, Thunb.

Epilachna hirta, Thunb. Nov. Ins. Spec. i. p. 23; Muls. Spec. Trim. p. 756.

Var.

Widely distributed "over the whole of Africa" (*Crotch*).

One example.

4. On a small Collection of Mammals brought by Mr. A. Sharpe from Nyassaland. By Philip Lutley Sclater, M.A., Ph.D., F.R.S., Secretary to the Society.

[Received January 13, 1892.]

Mr. Alfred Sharpe, H.B.M. Vice-Consul for Nyassaland, has kindly shown to me a collection of hunters' skins and horns of Mammals formed during his recent stay in the Shiré Highlands and in other parts of that territory.

A selection of these I have the pleasure of exhibiting this evening, and I have written a few notes upon them.

1. Colobus angolensis, Scl.

Colobus angolensis, Scl. P. Z. S. 1860, p. 246, 1880, p. 68; Bocage, Jorn. Lisb. ser. 2, i. p. 9.

Colobus palliatus, Peters, Monatsb. Berl. Ak. 1868, p. 637, 1879, p. 830, t. iv. *a*.

A flat skin of a fine adult example of this species with the elongated white hairs on the shoulders well developed, as shown in Peters's excellent figure of this well-marked species (*op. cit.* 1879, pl. iv. *a*).

Mr. Sharpe informs me that this skin was obtained at the north end of Nyassa in the Kondé country.

2. Cercopithecus pluto, Gray, P. Z. S. 1848, p. 56, Mamm. pl. 3.

A flat skin of this species, which, like *Colobus angolensis*, was originally described from Angola. It is from the interior, on the west side of Lake Nyassa.

3. Viverra civetta, Schreb.

4. Genetta tigrina (Schreb.); Bocage, *op. cit.* p. 177.

Flat skins of both these species, which appear to be abundant in the Shiré Highlands and all along the coast of Nyassa.

5. Herpestes albicauda, G. Cuv.; Thomas, P. Z. S. 1882, p. 75; Bocage, *op. cit.* p. 180.

Mr. O. Thomas has kindly named this skin for me. This *Herpestes* is a wide-ranging species in Eastern Africa, extending from Upper Nubia to Natal. The present specimen was obtained on the route between Lake Tanganyika and Lake Mocro.

6. Sciurus mutabilis, Peters, Reise n. Mossamb., Zool. i. p. 131.

The single flat skin of this Squirrel has likewise passed under Mr. Thomas's supervision.

7. Cobus vardoni.

Antilope vardoni, Livingstone, Miss. Trav. p. 256 (Barotsi Valley), and pl. p. 71.

Heleotragus vardoni, Kirk, P. Z. S. 1864, p. 657 (Zambesia).

Onotragus vardonii, Gray, Cat. Rum. (1872), p. 17.

Cobus vardoni, Selous, P. Z. S. 1881, p. 759; id. Wand. pp. 111, 147, 219, pl. v.

Vardon's Antelope was found occasionally by Mr. Sharpe about the south end of Lake Tanganyika, and in vast numbers on the route between Tanganyika and Lake Mocro. It goes in large herds [1].

I exhibit a fine pair of horns of this species procured by Mr. Sharpe.

8. Tragelaphus angasi, Gray.

Tragelaphus angasi, Brooke, P. Z. S. 1871, p. 487.

Mr. Sharpe brings a flat skin of what is apparently a male of this Antelope, hitherto not known to occur so far north. He gives me the following notes on it:—

"This Antelope is found in a piece of thick scrubby country bordering the Moanza, which enters the Shiré on the right bank near the Murchison cataracts. I have never seen it alive myself, but have heard of it frequently from the natives, by whom it is called 'Bō'—the *o* being pronounced very long.

"It frequents the thick scrub, and only occasionally comes out to the edges of the grass-flats.

"I have never heard of it in any other part of Nyassaland."

5. On a New Antelope from Somaliland, and on some other Specimens of Antelopes from the same Country. By P. L. Sclater, M.A., Ph.D., F.R.S., Secretary to the Society.

[Received January 28, 1892.]

(Plate V.)

I have now the pleasure of exhibiting the skull and scalp of an apparently new Antelope of the genus *Bubalis*, which I propose to name *B. swaynei*, after Capt. H. G. C. Swayne, R.E., who has kindly furnished me with the specimen.

The existence of an Antelope of this form in Northern Somaliland has long been known to me (*cf.* P. Z. S. 1885, p. 932), but it is only within the last few days that I have succeeded in obtaining specimens of it.

In a series of Mammals from Somaliland lately received from Capt. Swayne are a good adult skull and head-skin of what he terms the "Hartebeest" or "Sig" of the Somalis. One glance at this

[1] *Cf.* Sharpe, Pr. R. Geogr. Soc. 1892, p. 39.

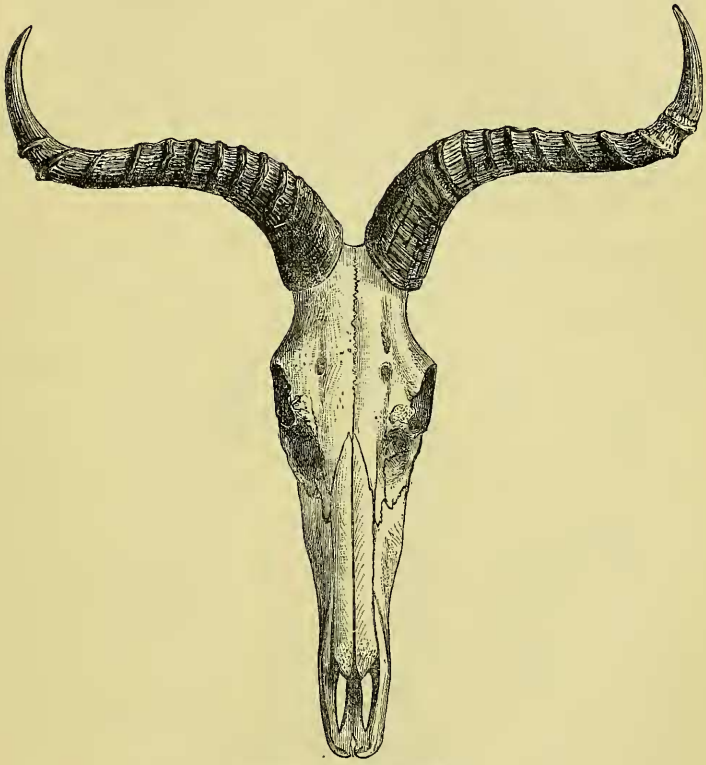
J. Smit del. et lith.

Mintern Bros. imp.

HEAD OF BUBALIS SWAYNEI.

head is sufficient to show that the "Sig" is not the same as the Hartebeest of the Cape (*B. caama*), but more nearly allied to the Tora (*B. tora*) of Upper Nubia and to Coke's Hartebeest (*B. cokii*) of British and German East-Africa, being in some respects intermediate between these two species.

Fig. 1.



Skull of *Bubalis swaynei*.

The horns of *Bubalis swaynei* expand widely, after rising from the base, nearly in the plane of the forehead. They then turn upwards and slightly inwards. The whole horns are strongly ringed anteriorly, as in the allied species.

In *B. cokii* the horns are shorter and not so widely expanded.

In *B. tora* the horns are quite as long as in *B. swaynei*, but rise much more rapidly from the basal portion, then come further forward and project much further backwards.

The face-skin of *B. swaynei* is of a dark chestnut, much darker between the eyes, and with a large black patch on the nose. The ears are brown exteriorly and light rufous interiorly.

In *B. tora* the whole face is of a uniform pale isabelline like the body.

In *B. cokii*, of which there are fine examples in Mr. Holmwood's collections, which I now exhibit, the whole front of the head is dark rufous and the sides of the head pale fulvous.

Thus *B. swaynei* differs from its two allies both in the structure of its horns and in the colour of its face.

It may be characterized as follows:—

1. Bubalis swaynei, sp. nov. (Plate V.)

Capite fuscescenti-castaneo, facie nigra; labiis et naso isabellinis; cervice brunneâ nigro irroratâ; mento nigricante; auribus brunneis, intus pilis rufescenti-albis limbatis; cornubus in plano faciali latè divergentibus, indè antrorsùm leniter exsurgentibus, apicibus ipsis retroversis; magnitudine B. caamæ.

Hab. In terrâ Somalicâ.

Besides the new *Bubalis*, Capt. Swayne's last collection contains specimens of the following Antelopes:—

2. Neotragus saltianus (De Blainv.); Thomas, P. Z. S. 1891, p. 211.

A skull and two skins of the male of this species, which is locally known as the "Dik-dik" or "Sakaroo."

3. Oreotragus saltator (Bodd.); Thomas, *l. s. c.*

A flat skin of a female, and a skull and head-skin of a male of this species, locally known as "Alikhud."

4. Gazella pelzelni, Kohl; Thomas, *l. c.*

A flat skin and a head-skin of this species, which Capt. Swayne terms the "Low-country Gazelle" or "Dero" of the natives.

I fear it was I that led Mr. Lort Phillips into the error of calling this Gazelle "*spekei*"—a name which, as Mr. Thomas has shown, belongs to the next species of the "High-country."

There is now a fine mounted specimen of this Gazelle in the British Museum and several skins. The present flat skin is decidedly rather paler in colour than the mounted specimen in the British Museum, but not otherwise different.

5. Gazella spekei, Blyth; Thomas, *op. cit.* p. 210.

Capt. Swayne sends a skull and head-skin of a female of this Gazelle, which he calls the "Big-nosed Gazelle." The horns of this example are particularly long and straight.

There is now also a good mounted specimen of this Gazelle in the British Museum, obtained from Herr Menges. Besides the points of difference pointed out by Mr. Thomas, it may be noted that the lateral stripe is much darker, nearly black in the present species.

6. Gazella sœmmerringi (Cretschm.); Thomas, *l. c.*

Three good skulls of males and five head-skins are in the collection.

This Gazelle seems to be abundant (*cf.* Lort Phillips, P. Z. S. 1885, p. 932), and is locally known as "Awal" or "Aiwal."

7. Ammodorcas clarkei, Thomas, P. Z. S. 1891, p. 207.

Of this Gazelle Capt. Swayne sent me two heads in a former collection. See P. Z. S. 1891, p. 197.

8. Lithocranius walleri (Brooke); Thomas, *l. c.*

Of this very peculiar form of Gazelle (the "Gerenook" of the

Fig. 2.

Head of *Lithocranius walleri.*

natives) there are four flat skins of males, four head-skins, and one skull in the series.

The British Museum have now fine mounted specimens of both

sexes of this Gazelle, received from Herr Menges, which show well the extraordinary long neck of this animal, as represented in the accompanying drawing (see p. 101). No other Antelope has a similar structure, which at once reminds one of a Giraffe.

9. Oryx beisa (Rüpp.) ; Thomas, *l. c.*

A skull and two flat skins of a female *O. beisa*, which is locally known as "Baet."

10. Strepsiceros kudu, Gray.

A flat skin of this Antelope, locally called "Arrah Gôder."

11. Strepsiceros imberbis, Blyth.

A flat skin of this Antelope, which is said to be known as "Goriali Gôder."

This makes 11 species of Antelopes of which Capt. Swayne has forwarded specimens from Berbera. I much regret that he has not sent me accompanying notes on their habits and exact localities, but he promises to do so.

At least two other Antelopes are found in Somaliland, namely, a Water-buck (*Cobus* sp. inc.), as mentioned by Mr. Lort Phillips (P. Z. S. 1885, p. 932); and a "small red Antelope of the Klipspringer kind; horns about 2 inches long; female hornless; same size as Alikhud: called 'Beira' by the natives": as described by Capt. Swayne in his letters. Capt. Swayne's brother, Lieut. E. J. Swayne, Bengal Staff Corps, met with this species in the Gadaburri country, but was not able to shoot a specimen. It may possibly be a *Cephalophus*.

6. On Numerical Variation in Teeth, with a Discussion of the Conception of Homology. By W. Bateson, M.A., Fellow of St. John's College, Cambridge.

[Received February 2, 1892.]

The following paper is an abstract of facts regarding the Numerical Variation of Teeth and of certain conclusions as to the nature of the conception of Homology as applied to Teeth which those facts have suggested. The observations concerning teeth form part of an investigation of the Variation of Multiple Parts in general, and I hope that before long the results of this work will be published in a complete form by Messrs. Macmillan, to whom I am much indebted for leave to use the blocks with which this paper is illustrated.

In an abstract it is clearly impossible to set forth the precise value and significance of the Study of Variation as a clue to the problems of Descent; but since by most this subject is wholly neglected, it may be well to state in the fewest words why it is that

this method of investigation is not merely a good one, but perhaps the best open to us.

The reason, then, is this. We assume that the transition from one form to another takes place by Variation. If, therefore, we can see the variations, we shall see the precise mode by which Descent is effected. Now the problem of Descent includes the problem of Homology, and, therefore, in any case of supposed Homology between organs the ideally best proof or disproof of such a supposition is to be had by appeal to the facts of Variation. For the statement that an organ of one form is homologous with the organ of another form means that there is between the two some connexion of Descent, and that the one organ has been formed by modification of the other or both by modification of a third. The precise way in which this connexion exists is not defined, and, indeed, has scarcely ever been considered, and though such a consideration must be hereafter attempted, the matter cannot be discussed here. We must be content for the present with the belief that in some undefined way there is a relationship between homologous parts, and that this is what we mean when we affirm that they are homologous. In the case of the homologies of Teeth, we are concerned with the application of this belief or principle to the case, not of a single organ, but to Multiple Parts arranged in Series. If, then, the whole series of teeth in one form is homologous with the whole series in another, we have now to consider how far we can extend the principle to the case of individual members of the two series. This is the question which is again and again arising with regard to Multiple Parts, but there are still no general principles by which it may be decided.

But though no one has told us the steps by which the Numerical Variation of teeth proceeds, there is nevertheless a received view by which it is sought to interpret the phenomena, and though there are several schemes upon which the homologies of teeth are defined, all are alike based upon one principle, which may be stated as follows.

It is believed that in the case of mammals, perhaps excluding the Cetacea, the series of teeth consisted originally of some maximum number from which the formulæ now characteristic of the several forms have been derived by successive diminution. On this view the series is believed to be always *composed of definite and individual members, which in any given form are either present or absent*; and the business of the homologist is then to determine which in each case is present and which absent. This hypothesis, of course, involves a definite conception of the mode in which Variation works, and it is most important to realize this clearly. For if it is true that each member of the Series of Teeth has in every form an individual and proper history, it follows that if we had before us the whole series of ancestors from which the form has sprung, we should then be able to see the history of each tooth distinctly and severally in the jaws of each of these progenitors. In such a series the rise of one individual tooth and the decline of

another would then be manifest. Each would then have its individual history, just as a Fellowship of a College or a Canonry of a Cathedral has an individual history, being handed on from one holder to his successors, some being suppressed and others being founded, but none being merged into a common fund. In other words, the received view of the nature of homologies in teeth *assumes that in Variation the individuality of each member of the series is respected.*

The difficulty in applying this principle is notorious, not only in the case of teeth but in all cases of Multiple Parts, such as digits, phalanges, &c.; and when the actual evidence of Variation is before us, the cause of this difficulty will become apparent enough, for it will be found that though Variation may sometimes respect the individual homologies, yet this is by no means a universal rule; and, as a matter of fact, in all cases of Multiple Parts, as to the Variation of which any considerable body of evidence has been collected, there are numerous instances of new forms arising in which what may be called the stereotyped or traditional individuality of the members has been superseded.

The present paper concerns the case of Teeth only, and even of this part of the evidence only a fragment can be given in this abstract, but perhaps it may suffice at least to indicate some of the possibilities which are opened up by the Study of Variation.

The material examined has consisted chiefly of specimens in the British Museum and the Museums of the College of Surgeons, Leyden, Oxford, and Cambridge, the Paris Museum of Natural History, and several smaller collections. I have to thank the authorities of these several museums for the great kindness I have received from them in the course of my work; and in particular I must express my indebtedness to Mr. Oldfield Thomas, of the British Museum, for the constant help and advice which he has given me, both as regards the subject of teeth generally, and especially in examining the specimens in the British Museum.

For various reasons I have for the most part limited myself to the following groups:—Primates (excepting Lemuroidea), Carnivora (Canidæ, Felidæ, Viverridæ, Mustelidæ, and Phocidæ), Marsupialia (Phalangeridæ, Dasyuridæ, Didelphyidæ, part of Macropodidæ, &c.).

Except in the case of teeth which are the terminal members of series, such as the first premolar or the last molar, very few facts of importance concerning the process of reduction in number were seen. From the fact that such cases are generally more or less ambiguous, they must be reserved for fuller treatment. For the present it must suffice to give a brief account of some of the more remarkable phenomena relating to increase in number of teeth.

The statistics relate to about 2500 skulls belonging to various orders, and the comparative frequency of supernumerary teeth in some of the different groups is interesting if only from its paradoxical character.

Primates.—Of the three larger Anthropoids—Orang, Chim-

panzee, and Gorilla—141 normal skulls were seen, and 11 cases of supernumerary teeth, or nearly 8 per cent. (in addition to 7 recorded cases known to me). On the other hand, no case was seen in 51 skulls of *Hylobates*, which were all normal. And of Old World Monkeys other than these, I found only two cases in 423 skulls, or less than ·5 per cent.

In the species of Cebidæ and in *Ateles* supernumerary teeth are common, five cases being found in 131 skulls, or nearly 4 per cent. (in addition to 4 recorded cases); while in 92 skulls of other New World Monkeys there was not one case.

Phocidæ.—139 normals, 11 cases of supernumerary teeth, or 7·5 per cent.

Otariidæ.—121 normals, 5 cases of supernumerary teeth, or 4 per cent.

Canidæ.—Of *wild* Canidæ, 289 normals were seen, and 9 cases of supernumerary teeth, or 3 per cent. (in addition to numerous recorded cases).

Of Domestic Dogs, including Pariahs, &c., 200 skulls were normal and 16 had supernumerary teeth, or 8 per cent. (besides many recorded cases).

Felidæ.—Of *wild* Felidæ, 278 normals and 6 cases of supernumerary teeth, or more than 2 per cent.

Of Domestic Cats, 35 normal and 3 cases of supernumerary teeth, or 9 per cent.

Viverridæ.—94 normals (not regarding variations affecting the first premolar only) and 4 cases of supernumerary teeth.

Owing to the great variability of the dentition of some groups of Marsupials and the difficulty of deciding on the normal formula, it would not be profitable to give summary statistics which should be satisfactory.

It will be seen that, so far as the statistics go, supernumerary teeth were more common in domestic Dogs than in wild Canidæ, and though the number of Cats seen was small, the same is true in their case also as compared with wild Felidæ. But though it is received by many almost as an axiom that domestic animals are, as such, more variable than wild ones, and though the figures somewhat support this view, it is necessary to point out that such a deduction should be made with great caution. For while it is true that the domestic Dog is more variable in its dentition than wild Dogs, it is not true that it is much more variable than many other wild animals, as, for example, the Anthropoid Apes, some of the Phocidæ, several genera of Marsupials, and others. The doctrine that domestication induces or causes Variation is one which will not, I think, be maintained in the light of fuller evidence as to the Variation of wild animals. It has been suggested by the circumstance that so many of our domesticated animals are variable forms, and that so little heed has been paid to the variation of wild forms. To obtain any just view of the matter, the case of variable domestic species should be compared with a species which is variable though wild.

The case of the great variability of the teeth of the large Anthropoids, which is shown not merely in numerical changes, but in frequent abnormalities of position and arrangement, is most striking, both when it is compared with the great rarity of variations in the teeth of the Old World Monkeys and the *comparative* rarity of great variations even in Man. If the Seals or the Anthropoids had happened to be domesticated animals, I do not doubt that many persons would have seen in this variability a consequence of domestication. When the whole evidence is examined, it will be found that we can make no generalizations of this kind, and that the variability of a form is, so far as can be seen, as much a part of its specific characters as any other feature of its organization. A few curious cases may be given in illustration. Of *Canis cancrivorus*, a S. American Fox, I know the following specimens only (in the British Museum)—normals (numerically): one whole skull with lower jaw, one skull without lower jaw, and one lower jaw without a skull, and in one of these right $\overline{m^3}$ is much larger than the corresponding left tooth; abnormals: two skulls have $\overline{m^4}$ on both sides, and a third has a large "odontome" formed as 4 small molars growing from right $\overline{m^3}$. Of *Felis fontanieri*, an aberrant Leopard, two skulls only are known (British Museum), and both of these show dental abnormalities, one having supernumerary left $\overline{m^2}$, and the other having an additional talon to right $\overline{p^3}$, making it almost a "bigeminous" tooth. In the Seals only three cases of reduplication of the first premolar were seen, and two of these were in *Cystophora cristata* (Leyden and Cambridge). Evidence of this kind might be multiplied indefinitely.

The following cases are chosen as representative examples or "Prerogative Instances" of different classes of phenomena which occur in connexion with increase in number of teeth. It will be understood that the cases are selected as illustrations, and that in order to have a full appreciation of their significance, the whole body of evidence must be taken together, for scarcely any two cases are exactly alike.

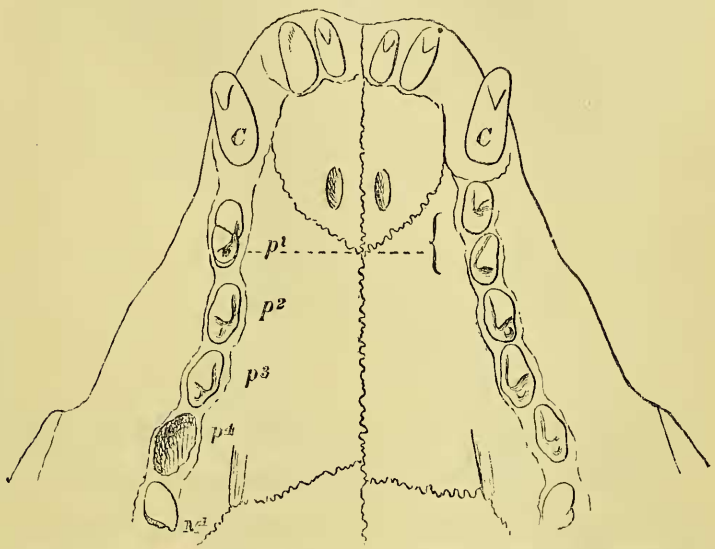
Division of individual Teeth.

Ommatophoca rossii.—Of this form two skulls only are known, namely, those in the British Museum. One of them has the arrangement usually found in Phocidæ, viz., five teeth behind the canines, giving the formula:—i. $\frac{2-2}{2-2}$, c. $\frac{1-1}{1-1}$, p. + m. $\frac{5-5}{5-5}$. By the analogy of other Seals, these five teeth are p. $\frac{4}{4}$, m. $\frac{1}{1}$. The other specimen is exceedingly remarkable (fig. 1). In it the incisors and the canines are the same as in the first specimen, but the first tooth behind the canine on both sides in the lower jaw and on the right side in the upper jaw has a very peculiar form, having a deep groove passing over the whole length of the tooth on both its outer and inner sides. These grooves extend from the tip of the root along both sides of the crown, and thus imperfectly divide each tooth into an anterior and a posterior half. The cusp of each tooth

is also divided by the grooves so as to form two small cusps. Each of these teeth is therefore an imperfectly double structure, and may be described as being just halfway between a single tooth and two teeth.

On the left side in the upper series, as the *vis-à-vis* to one of these double teeth, there are two complete teeth, standing near

Fig. 1.



Ommatophoca rossii, having the first upper premolar on the right side bigeminous, and on the left side represented by two complete and similar teeth. In the lower series the first premolar was bigeminous on both sides. From a specimen in the British Museum.

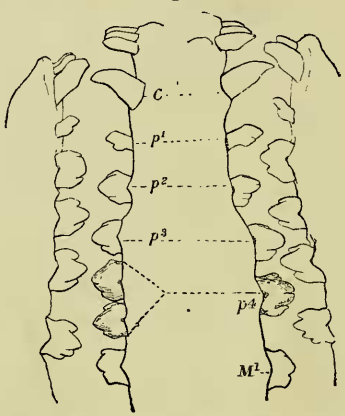
together, but having separate sockets divided from each other by a bridge of bone. The dental formula for this skull taken as it stands is :—i. $\frac{2-2}{2-2}$, c. $\frac{1-1}{1-1}$, p. + m. $\frac{5-6}{5-5}$, for since the bigeminous teeth are not completely divided into two, they must be reckoned as single teeth.

Phoca grœnlandica.—A specimen is preserved in the Leyden Museum having the arrangement shown in the figure (fig. 2[1], p. 108). The dentition of the lower jaw is the same on both sides. In the upper jaw there are on the left side *six* teeth behind the canine, while on the right side there are *five*, the normal number. But upon examination, one of these teeth, namely $\overline{p^4}$ of the usual nomenclature, is an abnormally large tooth, being especially thick in a transverse direction, and has besides a deep cleft in the crown,

[1] This figure was kindly drawn for me by Mr. J. J. Lister.

which is thus partially divided into two. Upon comparing this with the series on the left side, it appears that *two* of the six teeth stand level with this bigeminous tooth, and both bite between $\overline{p^4}$ and $\overline{m^1}$ of the lower series, though there is no crowding in the jaw owing to the large spaces which exist between the normal teeth of this species. There is, therefore, no doubt that the fourth premolar is on the left side bodily represented by two distinct teeth, each of

Fig. 2.



Phoca grœnlandica, having the fourth upper premolar on the right side bigeminous, and on the left side represented by two complete teeth (shaded). Right and left profiles; from a specimen in the Leyden Museum.

which is perfect and complete, while on the right side the process of division is incomplete.

In the Paris Museum (A 2897) there is a specimen of *P. grœnlandica* in which the second upper right premolar is represented by two teeth, each of which has two roots; but these two teeth stand at the same level in the arcade, one being external and the other internal. On the left side the second upper premolar is incompletely double, the crown being partially divided by an oblique constriction into an anterior and internal portion and a larger posterior and external part. The former has one root and the latter has two.

It is thus seen that reduplication of teeth may occur in such a way that a tooth which is normally single may be represented by two teeth, and that the two teeth thus formed may either (1) both take places in the ordinary series, or (2) may stand externally and internally respectively.

Substitution of two teeth for one, both being in series, was seen in *Ommatophoca rossii* ($\underline{p^1}$), *Phoca grœnlandica* ($\underline{p^4}$), *Otaria ursina* ($\underline{p^2}$), *Brachyteles hemidactylus* ($\underline{p^1}$), *Phalanger orientalis* ($\underline{p^1}$), ditto ($\underline{p^3}$), *Myrmecobius fasciatus* ($\overline{i^3}$), ditto ($\overline{i^4}$). Probably also cases of the presence of two similar small teeth in place of the first premolar in the Canidæ and Felidæ should be looked on as belonging to this

class, though the materials which support this view cannot easily be given in brief.

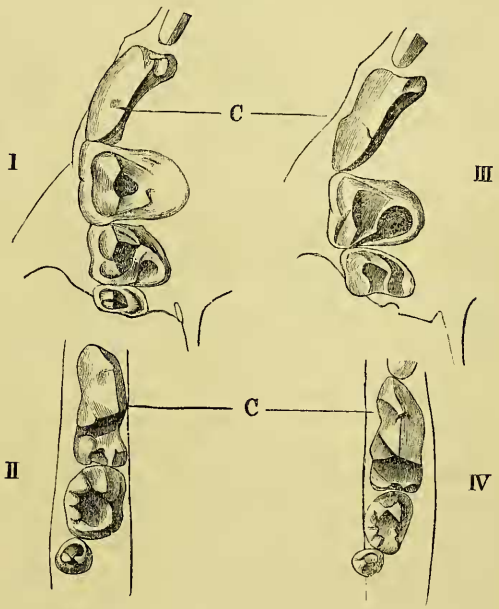
Partial or complete reduplication of teeth occurring in the second way was seen in *P. grœnlandica* ($\underline{p}^2$), *Otaria cinerea* ($\underline{m}^1$), *Canis mesomelas* ($\underline{p}^3$), *Vison horsfieldii* ($\overline{p}^1$), *Herpestes orientalis* ($\underline{p}^2$), *Herpestes gracilis* ($\overline{p}^3$), *Felis domestica* ($\underline{p}^4$), ditto ($\overline{p}^3$), *Phalanger orientalis* ($\underline{i}^3$), &c.

The power of a single organ to reproduce itself is of course not confined to teeth, but will be shown to be present in many different kinds of organs, and especially in those which are arranged as a Series of Multiple Parts.

Variation in Terminal Teeth when a new member is added to the series.

This is a phenomenon which is most instructive as a guide to the

Fig. 3.



Canis azaræ, from specimens in the Leyden Museum.

I. Right upper molars of a specimen having a supernumerary third molar on each side. II. The right lower jaw of the same. III. and IV. The right upper and lower jaws of a normal skull of rather larger absolute size, to show the increased size of the teeth in the abnormal specimen. C. The carnassial tooth.

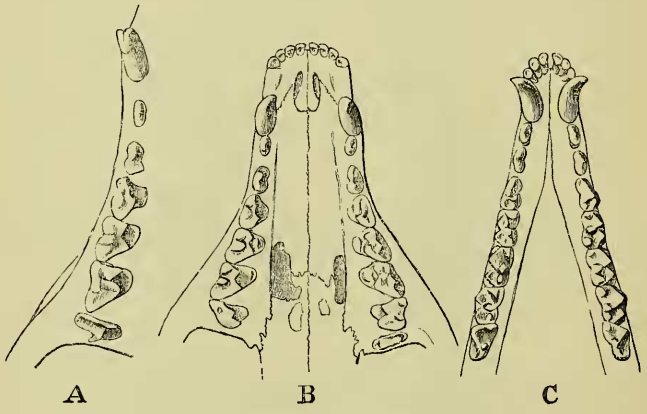
nature of the process by which Multiple Parts are formed. It may be stated generally that if the tooth which is the last of a normal

series is relatively a small tooth, as, for example, $\overline{m^3}$ or $\underline{m^2}$ in the Dog, then in cases of an addition to the series by which this terminal tooth becomes the penultimate it will be found that this penultimate tooth is larger and better developed than the corresponding ultimate tooth of a normal animal of the same size. Of this phenomenon two examples must here suffice.

The first is a skull of *Canis azaræ* in the Leyden Museum (fig. 3[1], p. 109). In this figure, I and II represent the back-teeth of this abnormal specimen, I being the upper, and II the lower jaw. By the side of these are shown the upper and lower jaws of a normal specimen of rather larger absolute size. In the upper jaw there is a supernumerary m^3 on both sides and the great enlargement in m^1 and especially in m^2 is very striking. In the lower jaw there is no extra tooth, but the molars are considerably larger than the normal size.

The next case is that of *Dasyurus maculatus*, having an extra

Fig. 4.



Dasyurus maculatus.

A. Right upper jaw of a normal specimen. B and C. Upper and lower jaws of an abnormal specimen having an extra molar in each lower jaw and in the left upper jaw. In correlation with this change the sixth upper back-tooth (m^3) has been increased in size. (The abnormal specimen was of less than normal size.) From specimens in the British Museum.

molar in the left upper and both lower jaws. In this case, owing to the great difference which normally exists both in shape and size between the last tooth and the last but one, some obscurity is introduced by the changes associated with the presence of an extra tooth, and it would be difficult to determine the nature of the upper teeth if this phenomenon of Variation were unrecognized. The structures are shown in fig. 4, A being the right upper jaw of a normal specimen, while B and C are the jaws of the abnormal form (Brit. Mus. 983 *b*). The normal specimen is unfortunately much larger

[1] This drawing was kindly made for me by Mr. J. J. Lister.

than the other, which Mr. Thomas tells me is abnormally small for the species. In the upper jaw of a normal skull there are two small premolars (p^1 and p^3 of Thomas) and behind these four molars. The molars increase in size from the first to the third, which is by far the largest. Behind the third is the fourth molar, which is much thinner than the others. On comparing the abnormal skull with the normal one it is seen, firstly, that on the left side there are seven teeth behind the canine, while on the right side there are only six such teeth, as usual. On the right side, however, the last molar has not the thin flattened form of the last molar of a normal skull, but is a fair-sized thick tooth. In each lower jaw there are seven back-teeth instead of six. In making a more detailed comparison, the first five teeth on each side are clearly alike, while from its form the seventh on the left side might be thought to represent the normal sixth, and this is the view originally proposed by Mr. Thomas in his 'Catalogue of Marsupialia,' p. 265, *note*. The difficulty in this view is that it offers no suggestion as to the nature of the sixth tooth on the right side. In the light, however, of what has been observed in other cases of extra molars, it seems likely that on the right side m^4 has been raised from a small tooth to one of fair size, while on the left side the process has gone further, m^4 being still larger and another tooth having been formed behind it. Mr. Thomas, to whom I am greatly indebted for having first shown me this specimen, allows me to say that he is prepared to accept the view here suggested.

This phenomenon, of the enlargement of the terminal member of a series when it becomes the penultimate, is not by any means confined to teeth, for the same is true in the case of ribs, digits, &c., and it is possibly a regular property of the Variation of Series of Multiple Parts which are so graduated that the terminal member is the smallest. This fact will be found of great importance in any attempt to conceive the physical process of the formation of Multiple Parts, and, pending a full discussion of this and kindred processes, it may be remarked that such a fact strikingly brings out the truth that the whole Series of Multiple Parts is bound together into one common whole, and that the addition of a member to the series may be correlated with a change in the series itself, and may occur in such a way that the general configuration of the whole series is preserved. In this case the new member of the series seems, as it were, to have been reckoned for before the division of the series into parts. This is, of course, only one way in which numerical Variation may take place; for, as was described in the previous section, additions to the series may be formed by the division of single members of the series, and in this case the configuration and proportions of the rest of the series remain normal. Examples of these two distinct methods of numerical Variation occur among Series of Multiple Parts of many kinds (digits, vertebræ, &c.).

Re-constitution of Parts of the Series.

Some curious instances of what is almost a remodelling of parts